Contents

Introduction vii

Contents ix

Chapter 1. Technological innovations

Growth and optical properties of semiconductor nanocrystals in a glass matrix
A. Ekimov 1

Synthesis and optical properties of coated nanoparticle composites
H.S. Zhou, I. Honma, J.W. Haus, H. Sasabe, H. Komiyama 21

Excitonic properties of nanostructure semimagnetic semiconductors
Y. Oka, K. Yanata 35

Semiconductor nanocrystals in carrier-transporting polymers: Charge generation and charge transport
Y. Wang, N. Herron 48

Optical measurements on semiconductor microcrystal beams generated by gas evaporation
S. Mochizuki 60

Spectroscopy of II–VI nanocrystals at high pressure and high temperature
J. Schroeder, P.D. Persans 69

Doped nanocrystalline materials – Physics and applications
R.N. Bhargava 85

Synthesis and characterization of binary and ternary III–V quantum dots
O.I. Mićić, A.J. Nozik 95

Quantum dots in quantum well structures
G.W. Bryant 108

Chapter 2. Theory of linear and nonlinear optical properties of semiconductor nanocrystals

Electronic structure of quantum spheres and quantum wires
J.-B. Xia 120

Electron–phonon interactions in semiconductor nanocrystals
T. Takagahara 129

Optical properties of semiconductor quantum dots in magnetic fields
S. Nomura, Y. Segawa, K. Misawa, T. Kobayashi, X. Zhao, Y. Aoyagi, T. Sugano 144

Auger relaxation processes in semiconductor nanocrystals and quantum wells
V.A. Kharchenko, M. Rosen 158

Theory of radiative and nanradiative transitions for semiconductor nanocrystals
M. Lannoo, C. Delerue, G. Allan 170

Strongly confined semiconductor quantum dots: Pair excitations and optical properties
Y.Z. Hu, S.W. Koch, N. Peyghambarian 185

Size- and shape-dependent optical properties of assembled semiconductor spheres
Y. Ohfuti, K. Cho 203

Chapter 3. Linear and nonlinear optical properties of CdSe nanocrystals

The role of photodarkening and Auger recombination in the dynamics of the optical response for Cd(S, Se) nanoparticles
C. Flytzanis, D. Ricard, M.C. Schanne-Klein 212

Photoluminescence polarization of semiconductor nanocrystals
M. Chamarro, C. Gourdon, P. Lavallard 222

Luminescence related processes in semiconductor nanocrystals – The strong confinement regime
V. Jungnickel, F. Henneberger 238

Two-photon spectroscopy and microscopy of II–VI semiconductor nanocrystals
S.A. Blanton, M.A. Hines, M.E. Schmidt, P. Guyot-Sionnest 253

Optical transitions in CdSe quantum dots: From discrete levels to broad gain spectra
U. Woggon, O. Wind, F. Gindele, E. Tsitsishvili, M. Müller 269

Electronic states of Cd-chalcogenide microcrystals embedded in GeO_2 glasses studied by means of spectroscopy
T. Arai, K. Matsuishi 281

Chapter 4. Optically active silicon-based materials

Photoluminescence and electroluminescence from porous silicon
P.M. Fauchet 294

Voltage-tunable photo- and electroluminescence of porous silicon
A. Bsiesy, J.C. Vial 310

Polarization phenomena in the optical properties of porous silicon
F. Koch, D. Kovalev, B. Averboukh, G. Polisski, M. Ben-Chorin 320

Light-emitting silicon materials
Y. Kanemitsu 333

Steric and electronic effects in the molecular quenching of porous silicon luminescence
J.L. Coffer 343

Optical properties of Si-rich SiO_2 films in relation with embedded Si mesoscopic particles
S. Hayashi, K. Yamamoto 352

Steady-state and time-resolved spectroscopy of porous silicon
S.V. Gaponenko, E.P. Petrov, U. Woggon, O. Wind, C. Klingshirn, Y.H. Xie, I.N. Germanenko, A.P. Stupak 364

Chapter 5. Metal-halide semiconductor nanocrystals

Dynamics of confined excitons and biexcitons of CuCl quantum dots
K. Edamatsu 377

Persistent hole burning in semiconductor nanocrystals
Y. Masumoto 386

Optical properties of nanocrystalline silver halides
M.I. Freedhoff, A.P. Marchetti, G.L. McLendon 400

Exciton–phonon coupling in indirect gap AgBr nanocrystals
H. Vogelsang, H. Stolz, W. von der Osten 414

Continuous photoluminescence, time resolved photoluminescence and optically detected magnetic resonance measurements of PbI_2 nanometer-sized particles, embedded in SiO_2 films
E. Lifshitz, M. Yassen, L. Bykov, I. Dag 421

Optical properties of ultrathin PbI_2 microcrystallite in polymer
T. Goto, S. Saito 435

Optical properties of nanostructures in layered metal tri-iodide crystals
T. Komatsu, T. Karasawa, I. Akai, T. Iida 448

Luminescence of charge transfer sensitizers anchored to metal oxide nanoparticles
T.A. Heimer, G.J. Meyer 468

Author Index 479

Subject Index 483